INFORMATION BULLETIN

Federal Communications Commission
Field Operations Bureau

TELEPHONE INTERFERENCE

This document has been prepared to assist you in understanding why interference to your telephone system occurs. Recommended solutions for you and your authorized telephone service technician are also provided.

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INTRODUCTION

This bulletin describes telephone interference caused by radio transmitters (such as CB, Amateur, and AM/FM radio stations) and explains how to control or eliminate such interference.

QUESTIONS AND ANSWERS ABOUT TELEPHONE INTERFERENCE

Q. What things could interfere with my telephone?

A. Many types of radio transmissions may radiate an energy field which induces the flow of radio frequency (RF) current on telephone wiring. Components inside telephones detect this current and demodulate it to audio signals. RF current can also disrupt the normal functions of telephones, answering machines, modems, and other equipment connected to telephone lines.

Q. I hear my neighbor's CB (or ham) radio on my telephone. Does this mean he can listen to my private telephone conversations?

A. No. He cannot hear you on his radio. He has no way of knowing that he may be causing interference.

Q. If I can hear his radio on my telephone, does that mean he must be violating some FCC regulation?

A. No. This is a common misconception. In fact, telephone interference generally happens because telephone systems are not normally designed to operate in the vicinity of radio transmitters. It does not generally happen because of a problem with the radio transmitter.

Q. How can that be? I did not have interference before my neighbor moved in (or started using his radio).

A. You did not have interference, but your telephone system was susceptible to the interference. It is like the difference between a symptom and a disease. The symptom is the interference, which only becomes noticeable when a radio signal is present. The disease, which was already there but lying dormant, is the susceptibility of the telephone system.

Q. Can my neighbor put something on his radio to stop the interference?

A. Since the problem is in your telephone system, there is little that your neighbor can do to eliminate the interference (other than turn off his transmitter). There are no filters or suppressors he could attach to his transmitter to reduce or eliminate the problem.

Q. Is an inexpensive telephone more susceptible to interference than an expensive model? Should I buy a "better" telephone?

A. No, not necessarily. A more expensive telephone with extra features (memory, speaker, displays, etc.) contains additional solid-state components. These may increase the unit's overall sensitivity to RF interference. Most modern telephone equipment is manufactured with little or no design consideration given to the suppression of RF interference. However, some telephones are commercially available which are guaranteed to be free of RF interference.

Q. If I filter my telephone (instead of replacing it) how many filters will I need?

A. There is no fixed answer. Prevailing conditions at each individual site dictate the requirements. Mild interference can sometimes be resolved with a single filter on the incoming line at the telephone. Moderate to severe interference might require filters at multiple locations in the wiring such as on the incoming line and one or both ends of the handset cord.

Q. Why doesn't the FCC protect telephones from interference?

A. The FCC does not regulate the design of telephone equipment, other than to ensure that the equipment does not harm the telephone network. Therefore, it offers no interference protection to telephones and telephone equipment. Telephone systems are not radios and are not intended to be capable of receiving radio signals. Nevertheless, they often do respond to signals from nearby radio transmitters. The FCC's role in telephone interference is limited to providing technical information and recommendations.

Q. Why does interference happen?

A. People think that telephone interference can only happen when radio operators use too much output power, are on "too high a frequency", or use antennas that are too tall. This is not necessarily true. Interference is usually generated within the telephone instrument itself. It cannot be eliminated by the nearby transmitter operator. However, it can be eliminated by filtering and shielding telephone wiring to block out the interfering radio signals from the telephone instrument and its internal components. Telephone interference may result from problems with either the telephone equipment, the lines, or both. Some telephones are more vulnerable to interference than others. Telephones with advanced features such as memory functions or an automatic redial are particularly susceptible to

interference because the sensitive electronic circuitry that controls these features may act as an unwanted radio receiver. Before you have your telephone repaired or buy a new telephone, follow the steps listed on pages 4, 5 and 6.

Q. What can my telephone company do?

A. Your local telephone company is responsible for protecting its lines and cables up to the junction box outside of your home or business from radio signals which can enter your telephone and cause interference. If you have an inside wiring maintenance contract with your telephone company, it may also shield your inside wiring (from the junction box to your telephone cord). Ask your telephone company about the charges before ordering inside wiring repairs. There may be some charges even if you do have an inside wiring maintenance contract.

If you lease your telephone instrument from the telephone company, it may provide shielding or filtering to eliminate the interference.

Your state public utilities commission, not the FCC, regulates telephone company charges for service calls and repairs.

Q. What can I do to resolve the problems?

A. If you do not have an inside wiring maintenance contract with your telephone company, you are responsible for providing whatever shielding and filtering may be necessary to protect the inside wiring. You may wish to contact the manufacturer of your telephone for information. Check your owner's manual for a toll free number for customer service. If not, check the list below. You may also need to obtain services from commercial telephone installers or repair technicians. If you cannot locate a phone number for your telephone manufacturer, contact the Electronic Industries Association (see below).

CORDLESS TELEPHONES

Cordless telephones are low-power radio transmitter-receivers. They are highly susceptible to radio, as well as electrical interference. They are intentionally designed to receive radio signals and can easily receive signals you do not want. Other nearby cordless telephones using the same frequency as yours can also interfere. Federal law requires a label on your cordless telephone to warn you about these potential problems.

Q. What can I do if I have interference?

A. Changing your cordless telephone to another frequency may help. On some models, you can do this with the push of a button. If your cordless telephone is preset to only one frequency, contact the manufacturer for help or try using the telephone in another part of your home.

Q. What can I do if I cause interference?

A. You must stop using your cordless telephone if you are notified that you are causing interference. You are required by law to eliminate any such interference. Your dealer or manufacturer can help with this problem.

The following list and the filter information are provided for your information and have been furnished by the firms themselves. For more information, contact the individual firms directly. The FCC does not endorse or recommend the use of any particular goods or services from firms on the list.

AT&T

Contact the nearest Phone Center Store, or call: 1-800-222-3111 Their National Sales & Service

Center sells a modular filter (Models Z100A & Z101A) for interference from AM radio stations.

PhoneMate

1-800-247-7889 or 213-320-9810

Sears

Sells telephones made by various manufacturers. Contact the nearest store to exchange your telephone for another model. If you are unhappy with the service, call Consumer Relations at 312-875-9674.

Sanyo

1-800-524-0047, Ext. 502 for Customer Service

GTE

503-650-4357 They will supply AM broadcast filters free of charge.

Soundesign Corp.

1-800-888-4491 for Customer Service.

Panasonic

1-800-922-0028 for Telephone Products Assistance

GE

1-800-626-2000 The GE Answer Center. Open 24 hrs. a day, 365 days a year. Will provide AM filters free of charge.

Northwest Bell Phones

1-800-822-1000 Customer Assistance Line. Sells telephones made by various manufacturers. Some models are designed to resist interference.

If your telephone manufacturer is not listed on the previous page, contact:

Executive Director of Consumer Affairs
Electronics Industries Association
2001 Pennsylvania Avenue NW
Washington, DC 20006
Telephone: 202-457-4900

Some of the above companies will provide interference filters free of charge. Also manufacturers will modify their telephones internally to make them immune to radio interference. Most provide this service free of charge (except for shipping charges) if the telephone is still under warranty. If the warranty has expired, you may have to pay for any repairs or modifications. Sometimes it may be more economical to replace a telephone than to have it repaired or modified.

TELEPHONE INTERFERENCE FILTERS AND CHOKES

There are two kinds of interference suppression devices on the market, ferrite cores or chokes and low-pass filters. Both types are intended to block the passage of the interfering signals while permitting telephone calls to pass unrestricted. Filters and chokes can be purchased in many electronic stores. They are also available by mail from some vendors. Most come with application instructions which give helpful installation information. Some filters are designed to filter AM broadcast interference but will not work well with FM, CB or amateur interference. Others are designed specifically for FM or amateur and CB interference and may not work well on AM broadcast interference. Proper installation is critical to the performance of all filters and chokes. Some experimentation may be necessary to determine the best filter or choke and the best installation location in a particular situation. Before you buy any filter, ask whether your money can be refunded if it does not help.

The following interference suppression products are listed for reference only. The Commission does not endorse or recommend the use of any commercial product. The suitability of the product for any particular application has not been evaluated by the Commission.

* **AT&T sells modular** telephone chokes (Model Z100A and Z101A) for interference from AM Broadcast stations. They are available at Phone Center Stores or from AT&T at 1-800-222-3111. Note: These chokes are <u>not</u> designed to suppress interference from CB or amateur stations.

* **Radio Shack** sells a "snap-on filter choke" (Catalog 273-104) and a "snap-together choke ferrite" (Catalog 273-105) which are said to be effective in filtering transmissions from CB and amateur stations.

* **Keptel, Inc.** sells filters (RFI-P) which are installed at the interface box. These are used by telephone companies in the USA. Telephone 201-389-8800.

* **SAMAS Telecom, Inc.** sells filters (SNI/CB-HAM RFI Noise Suppressor) which are installed at the interface box. These should not be confused with older models for AM broadcast bands ONLY. Telephone 714-598-0250.

* **Telecommunications Industries, Inc.** (TII) sells low-pass filters for use by telephone companies, but will refer retail customers to the nearest local distributor. You can either plug the filter (Model 831-W1) into a modular telephone jack or plug it directly into the telephone, but you must rig the other end of the filter to connect with the telephone cord. Telephone 516- 789-5020.

* **K-COM** sells two types of filters (Models RF-1 and RF-2). Model RF-1 plugs into the telephone and Model RF-2 is installed behind the jack. Mail orders only. P. O. Box 82, Randolph, OH 44265.

* **TCE Laboratories** sells filters (Model TP-12) which plug into the telephone. It also sells telephones that have been internally modified to reject signals from CB and amateur radios. Desk and wall models are available. Address: Route 9, Box 243-D, New Braunfels, TX 78133. Information available by telephone at: 512-899-4575.

* **PRO Distributors** sells guaranteed RFI-free telephones. Address: 2811 74th Street, Suite B, Lubbock, TX 79423. Telephone: 800-658-2027.

SELF-HELP PROCEDURES

The following procedure is often helpful in isolating the source of the problem. If you have more than one telephone or telephone accessory connected to your line, follow Step 1 below: These tests must be done while the interference is occurring.

Step 1: Disconnect all of your telephones and accessories such as an answering machine and take them to one telephone jack. Plug each one in one at a time and listen for the interference. If you hear the interference in only one telephone, the interference is being generated in that unit. Go to Steps 2 or 3. If all instruments produce interference, your outside telephone line or internal wiring may need filtering. Go to Step 4.

If any of your telephones are interference-free, the problem lies in the affected phone, not in telephone company equipment. It would not be necessary to call your telephone company for help.

If you have only one telephone, borrow a telephone of another type and see whether you can hear the interference in it. Some telephone companies and repair shops may have test telephones which have been modified to make them immune to radio frequency interference. If the interference is heard on a known interference-free telephone, you have a line problem which must be corrected before other action is initiated. Testing with an interference-free telephone at the interface box (usually located outside of the building at the end of the telephone cable drop line), will show whether the line problem is with your inside wiring or the telephone company's drop cable.

Step 2: Fixing equipment problems: The interfering radio signal can enter your telephone either:

(1) through the telephone line cord,
(2) through the handset cord, or (sometimes)
(3) directly through the case.

First, replace any extra-long cords with short ones. Try installing a filter on one end of the cord. Filtering of the end nearest the telephone is most likely to be effective. If one filter helps, a second one on the other end of the cord may help more. Sometimes a second or third filter on the handset cord is also necessary to prevent signal pickup by the handset cord. Telephones with multiple lines may need multiple filters. See the paragraph below on filters and chokes for additional guidance.

If filters are ineffective, you are probably having direct pickup of interference by the internal circuits of the telephone. If you own your telephone, contact the manufacturer for assistance. (If you lease your telephone, call the leasing company instead.) It may be more economical to replace a telephone with a less vulnerable model than to install filters or have it modified.

Step 3: Equipment problems with telephone attachments: If the interference is being generated in a telephone attachment such as an answering machine, handle it like equipment problems with telephones. Try installing filters first. If unsuccessful, contact the equipment manufacturer.

Step 4: Fixing telephone line problems: Request that your telephone company filter and shield its lines up to your interface box. If there is interference pickup on your inside wiring and you do not have an inside wiring service contract, you will be responsible for shielding and filtering your

inside wiring. Be sure to request a quotation before ordering repairs or modifications.

If the interference occurs while a service technician is present, (s)he should be able to find an effective location and install a filter there. Telephone company personnel usually call interference filters "suppressors". If the interference is not present while the service technician is there, the technician will not be able to pinpoint the best location for a filter. Request that the technician install a suppressor on the line and leave it there for a few days so that you can observe whether it helps. If your telephone company service technician tells you no suppressors are available, show him or her the list of filters on the following page. The models by Keptel, SAMAS and TII are designed for use by telephone companies.

SERVICE TECHNICIAN INFORMATION SECTION

This section is designed for use only by an authorized telephone service technician. Consumers are cautioned that only an authorized telephone service technician may internally modify telephone instruments. Only telephone company personnel may filter telephone company lines.

Before attempting to modify the telephone instrument itself, try filtering the incoming line and cords. Both ferrite beads and snap-together ferrite cores are available. These can be quite effective, especially for high frequency interference. You may need to experiment to find the best style of bead or core and the best location on the cord in a particular situation. Try the incoming cord first. Then try the handset cord. Cores and/or beads on both ends of both cords may be necessary in some instances. When locations are found that give best suppression, tape the cores or beads in place.

If the above steps are ineffective, the RF energy level on the incoming line may be greater than can be filtered with ferrite cores and beads. It may then be necessary to bypass, filter and possibly shield the drop cable and inside wiring. Only telephone company personnel may modify telephone company owned cables and lines. If the client has an inside wiring maintenance contract, the contracting company should install needed shielding and filtering of the inside wiring.

The service technician should also check for and correct the following conditions:

* corroded or rusty connections on the outside wiring,

* inside or outside loose wire connections or terminations,

* abandoned outside drop wires or abandoned inside wire loops.

Telephones with carbon microphones must usually have the carbon element bypassed for RF energy. Install a 0.001 mfd disk ceramic capacitor in the handset as close to the carbon microphone element as possible. If you can, solder it directly to the element contact fingers with the shortest possible leads. Depending on the particular model of telephone, you may need to bypass other components also.

Telephone instruments with special features such as memory, automatic redial, speakers, push–button dialing, and sound amplification contain transistors and integrated circuits sensitive to strong RF energy. Bypassing the input circuits and possibly shielding those components and circuits may be necessary. When adding capacitors and inductors to block RF energy, you must be careful not to use component values which will affect the normal operation of the circuits. Refer to the Bell Systems Practices Plant Series Manual, Section 500–501–100, for guidance.

If the service technician needs additional technical advice or if the client has additional questions about telephone interference, call the nearest FCC office listed at the end of this bulletin.

FCC OFFICE ADDRESSES

ALASKA, Anchorage Office
Federal Communications Commission
6721 West Raspberry Road
Anchorage, Alaska 99502
Phone: (907) 243-2153

*ARIZONA, Douglas Office
Federal Communications Commission
P.O. Box 6
Douglas, Arizona 85608
Phone: (602) 364-8414

CALIFORNIA, San Diego Office
Federal Communications Commission
4542 Ruffner Street, Room 370
San Diego, California 92111-2216
Phone: (619) 467-0549

*CALIFORNIA, Livermore Office
Federal Communications Commission
P.O. Box 311
Livermore, California 94551-0311
Phone: (510) 447-3614

CALIFORNIA, Los Angeles Office
Federal Communications Commission
Cerritos Corporate Tower, Room 660
18000 Studebaker Road.
Cerritos, California 90701
Phone: (310) 809-2096

CALIFORNIA, San Francisco Office
Federal Communications Commission
3777 Depot Road, Room 420
Hayward, California 94545-2756
Phone: (510) 732-9046

COLORADO, Denver Office
Federal Communications Commission
165 South Union Blvd., Suite 860
Lakewood, Colorado 80228-2210
Phone: (303) 969-6497

*FLORIDA, Vero Beach Office
Federal Communications Commission
P.O. Box 1730
Vero Beach, Florida 32961-1730
Phone: (407) 778-3755

FLORIDA, Miami Office
Federal Communications Commission
Rochester Building, Room 310
8390 NW. 53rd Street
Miami, Florida 33166
Phone: (305) 526-7420

FLORIDA, Tampa Office
Federal Communications Commission
2203 N. Lois Avenue, Room 1215
Tampa, Florida 33607-2356
Phone: (813) 228-2872

GEORGIA, Atlanta Office
Federal Communications Comission
3575 Koger Blvd
Koger Center-Gwinnett, Suite 320
Duluth, Georgia 30136
Phone: (404) 279-4621

*GEORGIA, Powder Springs Office
Federal Communications Commission
P.O. Box 85
Powder Springs, Georgia 30073
Phone: (404) 943-5420

HAWAII, Honolulu Office
Federal Communications Commission
P.O. Box 1030
Waipahu, Hawaii 96797-1030
Phone: (808) 677-3318

ILLINOIS, Chicago Office
Federal Communications Commission
Park Ridge Office Center, Room 306
1550 Northwest Highway
Park Ridge, Illinois 60068
Phone: (312) 353-0195

LOUISIANA, New Orleans Office
Federal Communications Commission
800 West Commerce Road, Room 505
New Orleans, Louisiana 70123
Phone: (504) 589-2095

*MAINE, Belfast Office
Federal Communications Commission
P.O. Box 470
Belfast, Maine 04915
Phone: (207) 338-4088

MARYLAND, Baltimore Office
Federal Communications Commission
1017 Federal Building
31 Hopkins Plaza
Baltimore, Maryland 21201
Phone: (301) 962-2729

*MARYLAND, Laurel Office
Federal Communications Commission
P.O. Box 250
Columbia, Maryland 21045
Phone: (301) 725-3474

MASSACHUSETTS, Boston Office
Federal Communications Commission
NFPA Building
1 Batterymarch Park
Quincy, Massachusetts 02169
Phone: (617) 770-4023

*MICHIGAN, Allegan Office
Federal Communications Commission
P.O. Box 89
Allegan, Michigan 49010
Phone: (616) 673-2063

MICHIGAN, Detroit Office
Federal Communications Commission
24897 Hathaway Street
Farmington Hills, Michigan 48335-1552
Phone: (313) 226-6078

MINNESOTA, St. Paul Office
Federal Communications Commission
693 Federal Bldg. & U.S. Courthouse
316 North Robert Street
St. Paul, Minnesota 55101
Phone: (612) 290-3819

MISSOURI, Kansas City Office
Federal Communications Commission
Brywood Office Tower, Room 320
8800 East 63rd Street
Kansas City, Missouri 64133
Phone: (816) 353-3773

*NEBRASKA, Grand Island Office
Federal Communications Commission
P.O. Box 1588
Grand Island, Nebraska 68802
Phone: (308) 382-4296

NEW YORK, Buffalo Office
Federal Communications Commission
111 West Huron Street, Suite 1307
Buffalo, New York 14202
Phone: (716) 846-4511

NEW YORK, New York Office
Federal Communications Commission
201 Varick Street
New York, New York 10014-4870
Phone: (212) 620-3437

OREGON, Portland Office
Federal Communications Commission
1782 Federal Office Building
1220 SW. Third Avenue
Portland, Oregon 97204
Phone: (503) 326-4114

PENNSYLVANIA, Philadelphia Office
Federal Communications Commission
One Oxford Valley Office Building
2300 East Lincoln Highway, Room 404
Langhorne, Pennsylvania 19047
Phone: (215) 752-1324

PUERTO RICO, San Juan Office
Federal Communications Commission
747 Federal Building
Hato Rey, Puerto Rico 00918-2251
Phone: (809) 766-5567

TEXAS, Dallas Office
Federal Communications Commission
9330 LBJ Expressway, Room 1170
Dallas, Texas 75243-3429
Phone: (214) 235-3369

TEXAS, Houston Office
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1225 North Loop West, Room 900
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Phone: (713) 861-6200

*TEXAS, Kingsville Office
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P.O. Box 632
Kingsville, Texas 78364-0632
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VIRGINIA, Norfolk Office
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1200 Communications Circle
Virginia Beach, Virginia 23455-3725
Phone: (804) 441-6472

*WASHINGTON, Ferndale Office
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1330 Loomis Trail Road
Custer, Washington 98240
Phone: (206) 354-4892

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11410 NE. 122nd Way, Suite 312
Kirkland, Washington 98034
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*Licenses and examinations are not available at * locations

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